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GEOPHYSICAL ABSTRACTS 114

JULY - SEPTEMBER 1943

COMPILED BY

W. AYVAZOGLOU AND V. SKITSKY

I.C. 7267,
December 1943.

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS 114
JULY - SEPTEMBER 1943[1]

Compiled by W. Ayvazoglou[2] and V. Skitsky[2]

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FOREWORD

Geophysical Abstracts 1 - 86 were issued in mimeographed form by the Bureau of Mines; Abstracts 87 - 111 were published in bulletins of the Geological Survey. Abstracts 112 and 113 were issued in mimeographed form by the Bureau of Mines as Information Circulars 7256 and 7257.

1. GRAVITATIONAL METHODS

7004. Campbell, R. B. Florida's Geological Structure and Gravity. Proc. Florida Acad. Sciences for 1940, Gainesville, Fla., vol. 5, 1941, pp. 73-84.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7267."

[2] Senior translator, Bureau of Mines.

Peninsular Florida is anticlinal, and west Florida has a regional dip south-southwest. If the relationships believed to exist between structure and gravity were true, the gravity values should diminish coastward. However, actually they only do so as far as the coastline, where they suddenly increase. This peculiarity seems to occur at all points on both the Atlantic and Gulf coasts. The author studies its possible reasons. A table is given of the data on free air, Bouguer, and isostatic anomalies for various profiles. These data are analyzed, together with similar phenomena in New Jersey, Virginia, and California-Nevada. The explanations of sedimentary load, decrease of acid rocks, and superficial structure are rejected as conflicting with the profiles. A possible explanation may be that the pre-Cambrian basement of Florida is composed of rocks of different densities arranged more or less linearly, with those of greater density near the shoreline. This explanation seems to be supported by the profiles, but the evidence is meager. - V. S.

7005. Elkins, T. A. Nomograms for Computing Tidal Gravity, Geophysics, Menasha, Wis., vol. 8, No. 2, 1943, pp. 134-145.

It is possible, by the use of a nomogram devised by Dr. James B. Friauf (Jour. Franklin Inst., vol. 232, 1941, pp. 151-174) for the solution of spherical triangles, to make simple nomograms for the computation of tidal gravity. Two types of such nomograms are explained and illustrated. The first is for computations at a fixed latitude of the earth; the second is for computations at a fixed point. With the second type the computation of tidal gravity is reduced to a simple routine matter, especially if The American Air Almanac is used as the source of the astronomical data needed. The accuracy of these nomograms is studied and comparison is made of this new method with that recently devised by Dr. Adler (Geophysics, vol. 7, 1942, pp. 35-44). - Author's abstract.

7006. Hammer, Sigmund, and Heck, E. T. A Gravity-Profile Across the Appalachians, Buckhannon, W. Va., to Swift Run Gap, Va. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 353-362.

A gravimetric profile has been surveyed from Buckhannon, W. Va. to Swift Run Gap, Va., through the entire folded sedimentary section of the central Appalachians. 101 gravimeter stations were used over a distance of about 150 miles by road. The gravity observations were made with a standard Gulf gravimeter, according to a "loop" scheme of subbases and intermediate stations. The stations were reduced by E. C. Bullard's modifications of the Coast and Geodetic Survey method; a novel interpolation technique was developed for terrain corrections. The results confirmed previous observations by Nettleton, Thom, Woollard, and others that a close conformity exists between gravity trends and topographic trends in the Appalachian area. The almost complete absence of gravity-expansion of the Paleozoic and possibly pre-Cambrian rocks tends to indicate that the major source of the Appalachian gravity features must be sought in the deep basement rocks. - V. S.

7007. Heiland, C. A. A Rapid Method for Measuring the Profile Components of Horizontal and Vertical Gravity Gradients. Geophysics, Menasha, Wis., vol. 8, No. 2, 1943, pp. 119-133.

The trend in gravity exploration in the past years indicates the rather remarkable fact that a method of low resolving power (the gravity meter) has replaced one of higher resolving power (the torsion balance). This is entirely due to the superior speed of the former and suggests an instrument and procedure in which observation time is reduced by (1) reduction in number of quantities measured; (2) use of a reference direction near that of the maximum effect; (3) elimination of the torsionless position as unknown; (4) reduction in period, with compensating increase in optical sensitivity; (5) stabilization of termal conditions. These objectives are attained by (1) measuring the profile components of gradients and curvature values, preferably at right angles to the assumed strike; whereby, for an ideal two-dimensional feature, also the vertical gravity gradient is obtained, and the vertical and horizontal gravity components may be calculated by integration; (2) by holding the torsionless position constant with temperature control; (3) by decreasing the period and observation time to 3-4 minutes, and (4) by using a beam arrangement which will give the gradient in only one azimuth if desired. Latitude and terrain corrections are also somewhat simplified by the proposed procedure. - Author's abstract.

7008. Hersey, J. B. Gravity and Magnetic Studies Along the Paleozoic-Triassic Contact in Eastern Pennsylvania. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 350-353.

Gravity and magnetic surveys were made in the area between the Delaware River, Emmaus, and Quakertown, Pa., by means of the Humble gravimeter and Askania vertical magnetometer. The object was to study the nature of the contact between the pre-Cambrian and Paleozoic and the Triassic sediments and to outline the traprock intrusives in the Triassic. Only preliminary results are available. 120 gravity stations were used; the gravity values were reduced for latitude, elevation, and Bouguer-effects, and a contour map was prepared on the basis of Bouguer anomalies. The results showed a distinct relation between anomalies and areas of traprock. The magnetic surveys were made with Schmidt vertical balances. The first survey showed that the main disturbing factor in Triassic areas is the traprock and that there is an abrupt magnetic difference in going from the Triassic or from Paleozoic limestone to the pre-Cambrian areas. The second magnetic survey mapped the edges of trap bodies near the Triassic-Paleozoic contact. A pronounced magnetic "high" was found over the trap-side of the contact zone, and a "low" over the sediment side, so that the contact should be placed between the "low" and the "high". - V. S.

7009. Jeffreys, Harold. The Determination of the Earth's Gravitational Field (Second Paper). Monthly Notices, Royal Astronom. Soc., Geophys. Suppl., London, vol. 5, No. 3, 1943, pp. 55-66.

The data used in a recent paper (see Abs. 108, No. 6131) on the same subject have been rediscussed by a more sensitive method for detecting variations of gravity capable of being represented by spherical harmonics of low degrees. In the first place all cross (nondiagonal) terms in the normal equations for the coefficients were neglected; in the second approximation the terms most strongly suggested by the first approximation were determined by the method of least squares. One second harmonic and three third harmonics, besides the terms included in the usual formulae, were found to be determinable. The variation shows no relation to the elevation of the surface and is inconsistent with accurate compensation. A new determination of the constant and the main ellipticity terms is made incidentally. No fourth harmonics are determinable on the data, but a suggestion is offered for the treatment of an independent term in P_4 if occasion should arise. - Author's abstract.

7010. Klaus, H. Faulting in the Billings Field, Oklahoma, as Interpreted from Torsion Balance Data and from Subsequent Drilling (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 325.

The results of an experimental torsion-balance survey of the Billings oil field are shown by means of the conventional maps and second-derivative contour maps. The latter show good, consistent anomalies interpreted as faulting. The survey was made in July 1937, some time after discovery of Ordovician production in the field but long before faulting was established by drilling, and the results of the surveys were communicated to several oil companies interested in the area or in the method of analysis. Meanwhile, faulting has been established by drilling, and the present subsurface interpretations are compared with the original torsion-balance predictions with respect to such faulting. From the amount of agreement between the two sets of data, it is concluded that the torsion balance may still be used effectively for specialized purposes, particularly the investigation of faulting.

7011. Legge, J. A., Jr. Determination of the Elevation Factor by the Method of Least Squares (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 328.

A method is presented whereby the elevation factor based on the Bouguer equation may be determined by the method of least squares. The method may be applied to stations along a straight line or those distributed haphazardly over an area.

7012. Milcoveanu, Dan. Calcul du gradient pour un cylindre d'axe vertical (Calculation of the Gradient for a Cylinder with Vertical Axis). Bull. Acad. Roumaine, Bucureşti, vol. 22, No. 7, 1940, pp. 318-328.

Derivation of the horizontal gravity gradient for a vertically infinite cylinder. The integration leads to spherical harmonics, and a solution is given in form of a binomial series. - C. A. H., Annotated Bibliography of Economic Geology, vol. 14, No. 1, 1942, p. 125.

7013. Skeels, D. C. Gravity Anomalies in Sedimentary Basins. Trans. New York Acad. Sciences, ser. 2, vol. 5, No. 5, 1943, pp. 87-91.

The writer analyzes the bearing of geodetic pendulum data on the process of basin development. The data cover the Black Hills-Bighorn-Beartooth profile; Ardmore Basin, southern Oklahoma; Po Basin, northern Italy; Carpathian foreland, Poland; and Caucasus region and Kouznetsk coal basin, U.S.S.R. This evidence does not support the isostatic view that the weight of the sediments causes sinking of the floor of basins. The Bouguer anomalies are offered as principal examples. According to isostatic theory, high areas should have negative Bouguer anomalies; low areas, positive anomalies. But the deep sedimentary basins constitute a remarkable exception. They are not compensated at depth and are actually out of isostatic balance. On the other hand, the theory of crustal downarp gives a good explanation of these observations. It holds that there must have been some deficiency of mass throughout the period of deposition, so that the sinking took place not because of, but rather in spite of isostasy. The author concludes that there is need for a revision of ideas regarding isostasy and the strength of the earth's crust. - V. S.

7014. Woollard, G. P. Geologic Correlation of Areal Gravitational and Magnetic Studies in New Jersey and Vicinity. Bull. Geolog. Soc. America, Washington, D. C., vol. 54, No. 6, 1943, pp. 791-818.

An abstract of this article appeared in the same journal, vol. 52, No. 12, 1941 (see Abs. 108, No. 6380).

2. MAGNETIC METHODS

7015. Fleming, J. A., and Scott, W. E. List of Geomagnetic Observatories and Thesaurus of Values. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 48, No. 2, 1943, pp. 97-108.

Since 1930 the International Association of Terrestrial Magnetism and Electricity has taken steps to publish a complete list of all fixed magnetic and electric observatories, with statements of geographical coordinates, elevations, instrumental equipment, data published regularly, etc., as well as a thesaurus of magnetic values. Because of the uncertainties of the war, it has now been decided to issue several sections of this list in a preliminary form. The present article contains Table I, "Annual Values of Geomagnetic Elements at Observatories". The table covers: (1) Name of observatory, (2) latitude, (3) longitude, (4) year, (5) declination D, (6) inclination I, and (7) components of intensity: horizontal H, North X, East Y, vertical Z, total F. The succeeding parts of this table will be published in forthcoming numbers of the same journal. - V. S.

7016. Fleming, J. A. Researches in Terrestrial Magnetism and Electricity at Department of Terrestrial Magnetism, Carnegie Institution of Washington, for the Year April 1941 to March 1942. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 312-315.

The researches in terrestrial magnetism and electricity are described under five headings: (1) Geomagnetic investigations - annual variation of geomagnetism at Polar Year stations, occurrence of geomagnetic bays; construction of isomagnetic charts. (2) Observatory work at Huancayo and Watheroo - regular geophysical work, cooperation with other observatories; establishment of an observatory at College, Alaska. (3) Survey work - data on secular variation and new distribution; reduction of magnetic and auroral data of the U. S. Antarctic Expedition. (4) Geoelectrical investigations - nuclei of condensation from various sources; behavior of the Aitken nuclei-counter; comparison of simultaneous atmospheric-electric data over the ocean and at a land-station. (5) Ionospheric investigations - observation of

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the ionosphere at Huancayo and at Watheroo, a detailed analysis of electrification of the outer atmosphere. - V. S.

7017. Galbraith, F. The Magnetometer: Its Use as a Geological Instrument. Min. & Indust. Mag. Southern Africa, Johannesburg, vol. 31, No. 1, 1943, pp. 19-23.

This article has previously appeared in Am. Inst. Min. and Met. Eng. Tech. Pub. 1482, 6 pp., New York, 1942 (see Abs. 110, No. 6599). - V. S.

Hersey, J. B. Gravity and Magnetic Studies Along the Paleozoic-Triassic Contact in Eastern Pennsylvania. See Geophys. Abs. 7008.

7018. Howe, H. H. Recent Alterations in Geomagnetic Secular Variation in Eastern North America. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 292-294.

About the year 1933 there was an alteration in the rate of change of magnetic declination (D) in the eastern part of the United States. In 1941 the author also noted an alteration in the rate of change of the horizontal intensity (H). It thus became desirable to devise a single graphical representation of the combined change of D and H. Varying distance and direction composing secular change can be shown by plotting the vector difference between consecutive points, drawn from a common origin. Each vector of such a graph represents the horizontal projection of the field, to be added to the mean field for one year to obtain the mean field for the next year. A figure in the text shows such horizontal projection of termini of vector differences of mean fields for consecutive years. - V. S.

7019. Johnston, H. F. American Magnetic Character-Figure, C_A, Three-Hour-Range Indices, K, and Mean K-Indices, K_A, for January to March, 1943. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 48, No. 2, 1943, pp. 93-96.

Tables are given. - V. S.

7020. Kalashnikov, A. G. An Experimental Method for the Graphic Construction of the Magnetic Fields of Bodies of All Shapes (Method of the Coordinate Fieldmeter). (In Russian.) Doklady (Trans.) Acad. Sciences U.S.S.R., Moscow, new ser., vol. 32, No. 1, 1941, pp. 47-49.

The theoretical problem of the magnetic field of variously shaped magnetized bodies has not been so far solved in its general form. The author has investigated this problem experimentally for several specific cases found in geophysical practice. He has utilized the principle of a metal contour revolving with constant velocity, for which the current is proportional to the intensity of the magnetic field. An apparatus was devised for applying this principle. It contains a small coil rotating with constant velocity and movable along three coordinate axes into any position in space. By means of this coil, the intensity of a magnetic field can be measured at any point in terms of its three vectors, and an intensity profile can be constructed for any vector. It thus becomes possible to measure the distribution of intensity in the magnetic field of a body of a given shape. Inversely, it may be possible to determine the shape of a body, such as a subterranean formation, by the distribution of intensity in its magnetic field. - V. S.

7021. Knapp, D. G., and Howe, H. H. Magnetic Observatory Results at Sitka, Alaska, for 1933-34. U. S. Coast and Geod. Survey, Washington, D. C., MO-13, 1942, 118 pp.

Tables with text are given covering instruments, constants of the magnetograph, absolute observations vs. base-line values, and the explanation of results. - V. S.

7022. Lasareff, P. P. Études des variations séculaires du magnétisme terrestre. I. Variations séculaires déduites de la théorie de Biot. (Studies of Secular Variations of Terrestrial Magnetism. I. Secular Variations Deduced from the Theory of Biot.) Comptes rendus (Doklady) Acad. Sciences U.R.S.S., Moscow, new ser., vol. 25, No. 1, 1939, pp. 26-29.

A mathematical discussion is given of secular geomagnetic variations. Biot's distribution of geomagnetism serves as the basis of calculations. It is assumed that secular variations are produced by a uniform rotation of the dipole of Biot and that the axis of this dipole always passes through the center of the globe, tracing by its motion a circular cone. The treatment is trigonometrical. Theoretical formulas are at first evolved for the vertical and the horizontal components and the declination of the force of terrestrial magnetism, for every point of the earth's surface and for every epoch. Then two particular instances are studied on further assumptions, in greater detail: (1) Secular variations at the geographical equator, and (2) secular variations at the geographical pole. - V. S.

7023. McComb, H. E. Geomagnetic Observatories and Instruments. Proc. Am. Phil. Soc., Philadelphia, vol. 84, No. 2, 1941, pp. 239-255.

Development of magnetic observatories and observatory instruments. Of interest are illustrations of the La Cour quartz horizontal and vertical magnetometers. - C. A. H., Annotated Bibliography of Economic Geology, vol. 14, No. 1, 1942, p. 127.

7024. McNish, A. G. Fossil Magnetism. Sci. American, New York, vol. 99, April, 1943, pp. 166-167.

The direction of the magnetic force is known to change with time at different places on the earth's surface. The changes observed have been as large as 35° in the direction of the horizontal component in 200 years. The author investigated these changes by examining the magnetization of the varved Pleistocene clays. Embedded in these clays are minute particles of magnetite. These particles had alined themselves with the magnetic field at the time of their deposition and were then locked in place by subsequent layers of clay. A study of their direction leads to the conclusion that the changes through the geologic ages have not differed markedly in magnitude and rate from those during historic times. Moreover, Fisk has demonstrated that secular changes are essentially regional. On the basis of the total evidence magneticians postulate schematically: (1) A small but powerful magnet near the center of the earth, to produce the uniform field; and (2) sets of considerably weaker magnets located midway between the center and the surface, to produce the residual field and the secular variations. - V. S.

7025. Nelson, J. H., and Ludy, A. K. Improvements and Modifications to a La Cour Magnetograph. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 441-446.

Improvements to the La Cour magnetograph relate to Z-variometer, H-variometer, D-variometer, thermograph, time-flashing system, recorder, and diaphragms. By means of these alterations the magnetograph, originally designed for work in the polar region, is now adapted to moderate conditions. The writers report that during the final test period at the Cheltenham Observatory excellent results were obtained. The quality of the light spots was considerably better than the average now being realized. The modified La Cour magnetograph will be installed in the new variation observatory constructed during 1939 at Tucson, Ariz. - V. S.

7026. Swainson, O. W. Magnetic Work of the United States Coast and Geodetic Survey from April 1941 through March 1942. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 310-312.

An account is given of the work of magnetic observatories, cooperation with other organizations, special assistance from Works Project Administration, progress in data for nautical and aeronautical charts, issue of the isogonic chart of the United States, for 1940 field work in the Caribbean area for a new isogonic chart, and national defense surveys along the East, Gulf, and West coasts. In the defense work the vertical intensity (Z) had to be obtained. Since suitable instruments are lacking, tests were made of two experimental instruments, one being developed by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington and the other by the Geophysical Section of the Geological Survey. - V. S.

7027. Vacquier, Victor, and Affleck, James. A Computation of the Average Depth to the Bottom of the Earth's Magnetic Crust, Based on a Statistical Study of Local Magnetic Anomalies. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 446-450.

The earth's crust is composed of a sedimentary layer, a granitic layer, and an underlying layer. The writers describe the magnetic properties of each layer, their variations, and the resulting magnetic anomalies. On the basis of this information a method is further devised for calculating the average depth to the bottom of the earth's magnetic crust. On the one hand, a series of theoretical curves is plotted of the variation of the maximum anomalous vertical intensity with change in depth to the top of the magnetic igneous layer. On the other hand, a number of magnetic anomalies are selected from contour maps of vertical magnetic intensity, and statistical curves are plotted for the intensity as a function of the depth; the anomalies fall into two classes. Finally, by a curve-matching scheme, the best fits between the theoretical curves and the statistical curves are determined for each type of anomaly, thus providing two independent solutions of the depth to the bottom of the inhomogeneous magnetic layer. The calculations are given. They showed that the bottom of the layer of magnetic inhomogeneitics is at an average depth of 11 to 15 miles from the earth's surface. - V. S.

3. SEISMIC METHODS

7028. Ayre, R. S. Experimental Response of an Asymmetric, One-Story Building Model to an Idealized, Transient Ground Motion. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, No. 2, 1943, pp. 91-119.

An experimental investigation was made at Stanford University of the effects of an idealized ground motion on an unsymmetrical one-story building model. The model was a rigid mass free to move only in a horizontal plane. It was mounted on a shaking table, the motion of which was a unidimensional, damped sinusoid. The motion varied in direction and frequency; the friction in the model, in magnitude and distribution. A detailed description is given of the experimental apparatus, procedure, results, and conclusions. Some of the conclusions are as follows: (1) The distortion of parallel walls may differ greatly, for a particular direction and frequency of ground motion, as much as 350 percent; (2) relatively large rotations may be induced because of coupling throughout the range of ground frequencies; and (3) resonance can occur in any one of three natural frequencies instead of only two, as in the symmetrical system. - V. S.

7029. Blake, Archie. On the Determination of Elastic Constants within the Earth from Seismometric Data (Abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, p. 233.

In the absence of data good enough to permit the method of Pekeris and Slichter to be used, the most informative source of knowledge concerning the elastic constants within the earth is the travel-time curves of the seismic P- and S-waves. The computation of the velocity function from the travel-time curve involves the solution of Abel's well-known integral equation. The treatment of this type of equation is facilitated on the theoretical side by the terminology of functions as opposed to variables and on the computational side by central difference methods and the use of machines.

7030. Blake, Archie. Progress Report on Periodicity and Time Series (Abs.). Nat. Research Council, Am. Geopgys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 407-408.

New statistics designed to detect effects not contemplated in the Schuster periodogram are tried in a study of the series of aftershocks of the earthquakes of October 1935 at Helena, Mont. This work is done by the use of punch cards, which reduce the labor of computation. In the case of two types of departure from randomness, such as periodicity and smoothness, each effect disturbs the statistics designed to detect the other. Stricly speaking, the only rigorous treatment is to study them together. The author considers, however, that appoximate methods, such as Bartels', for discounting the effect of one type of variation in studying the statistics designed to detect the other may likewise be useful. - Condensed by V. S.

7031. Campbell, R. B. Earthquakes in Florida. Proc. Florida Acad. Sciences, Tallahassee, Fla., vol. 6, No. 1, 1943, pp. 1-4.

A number of earthquakes have been recorded in Florida; these are listed. Seismic activity is distributed over two areas separated by the 27th parallel, the segment to the north corresponding to continental structure, and the segment to the south to the Atlantic region. This division corresponds to recent magnetometer studies. By recording seismic activity, it may be possible in the next few years to map subsurface structural trends. - V. S.

7032. Electronics. Film-Recording Seismograph. Albany, N. Y., vol. 16, No. 5, 1943, pp. 89-92.

Describes a Benioff film-recording seismograph. This apparatus has been developed at the California Institute of Technology and is used by the United States Bureau of Reclamation and the United States Coast and Geodetic Survey for determining whether the concentration of a very large weight, such as a water dam, on a small area can cause local earthquakes. The seismograph is equipped with a coil positioned in a doughnut-shaped magnet and employed to measure the motion of the earth with respect to a pendulum. Photographic recording is effected through a lamp-lens system connected with each seismometer and projecting a narrow beam of light on the galvanometer mirror. The resulting reflected beam falls on standard 35-mm. motion-picture film wrapped around a drum driven at constant speed. Special devices are used to assure accurate recording of the time of arrival of the different wave phases. An additional vertical seismographic element called the flasher is provided for registering the first impulses of local earthquakes. - V. S.

7033. Gutenberg, Beno. Earthquakes and Structure in Southern California. Bull. Geol. Soc. America, Washington, D. C., vol 54, No. 4, 1943, pp. 499-526.

During recent years the accuracy in determining the arrival times of earthquake waves in southern and central California has been notably improved, so that more detailed results concerning the structure of the earth's crust in California are to be expected from the study of such records. Fifty shocks were selected, and their epicenters, depths of foci origin times, and magnitudes determined and discussed. All known corrections have been applied; in particular, the effect of the altitude of some of the stations is beyond the probable error of the readings. With this improved material it is possible not only to investigate more accurately than heretofore the wave velocities in the various layers but also differences in structure, especially local effects near the stations. - Author's abstract.

7034. Gould, M. J. Note on Relation of Ground Roll from Explosion to Ground Roll from Ground Shaker (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 329-330.

An experimental investigation is described on the propagation of ground roll from an explosion and of surface waves from a ground shaker. The underground structure at the site of these observations was carefully determined from a shallow refraction profile and logging. Dispersion curves are presented in the form of phase velocity as a function of L/H (wave length ÷ thickness of low-velocity layer). The phase velocity of the ground roll is a linear function of L/H, over the range of L/H observed. The surface waves from the ground shaker give a different dispersion curve over a lower range of L/H. The two curves seem to come together at L/H = 8. When the ground-shaker curve is taken to be the extension of the ground-roll curve to small L/H, the dispersion curve predicts the observed value of the group velocity of the ground roll.

7035. Hayes, R. C. The Subcrustal Structure in the New Zealand Region from Seismic Data. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, No. 2, 1943, pp. 75-80.

A study of the distribution of focal depths of earthquakes has been made in New Zealand. The purpose was to determine the subcrustal structure in the region of the principal shocks during 1931-41. The results show the existence of a discontinuity of more or less regular form, its depth ranging from about 30 km. to more than 350 km. The vertical profiles suggest that below this discontinuity the material is so viscous as to have been distorted by plastic flow into folds. Earthquakes occur above the discontinuity. The principal fold continues to be forced upward, causing fractures in the material above. - V. S.

7036. Jeffreys, Harold. On Pulses whose Travel Times Are Not True Minima. Proc. Cambridge Phil. Soc., Cambridge, Great Britain, vol. 39, part I, January 1943, pp. 48-51.

The wave theory of reflection is usually applied only to cases where the travel time of impulses is a minimum. Case "PP" is different; at any time after that of "P," a locus of points can be found on the sphere such that waves scattered thereat would be arriving. The writer studies this case as an example of impulses whose travel times are not true minima. A direct mathematical treatment meets insuperable difficulties; however, the same physical conditions characterize the spreading of a cylindrical explosion. A mathematical solution of this case is given. It suggests that when the travel time is not a true minimum, the pulse will be large and diffuse. This calculation agrees with seismological evidence. Thus, the anology of the cylindrical pulse can explain the diffuseness of the seismological pulses whose times are not true minima, and the large scatter of their readings. - V. S.

7037. Leet, L. D. Some Applications of Pure Seismology to Geological Problems (Abs.). Tulsa Geol. Soc. Digest, Tulsa, Okla., vol. 10, 1941-42, p. 42.

Three surface layers have been identified in northeastern America from refraction profiles obtained at the Harvard Seismograph Station. The travel times are given in a table:

Structure represented by trial travel times

Thickness (km.)					
From P	From S	Layer or zone	Poisson's ratio	Velocity (km./sec.) P	S
16	15	Layer 1	0.27	6.13	3.45
13	10	Layer 2	.25	6.77	3.93
7	10	Layer 3	.23	7.17	4.27
		Zone of Pn, Sn	.28	8.43	4.62

In New Hampshire, travel times for elastic waves from two earthquakes in December 1940 yielded information on the mechanism of the shocks and their relation to the structure of the surface layers. The large shocks in northeastern America have been separated during the past 50 years by decreasing intervals, indicating that the area is in an epoch of growing seismicity. - Condensed by V. S.

7038. Linehan, Daniel. Seismic Prospecting in New England. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 227-228.

Seismic studies in New England are enumerated. Ground motion during large quarry blasts has been studied with a three-component seismometer by L. Don Leet; he made experiments in all of the New England States and in eastern New York State. Similar studies have been made by L. B. Slichter in the Triassic Basin in Connecticut. Surveys of depth to bedrock and dept of glacial and sediment cover were run with single-component instruments by F. W. Lee and L. W. Currier in parts of Massachusetts. Weston College made studies in several States, mostly of the depth of cover over bedrock. Other surveys are enumerated in the paper. - V. S.

7039. Lynch, Joseph. Amateur Seismology (Abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 400.

The two instruments that seem most feasible for worthwhile amateur work in seismology are the Sprengnether-Macelwane electromagnetic seismograph, which Sprengnether will construct for $160, and the Joliat optical seismograph, both vertical and horizontal. Details of both will be published later. During the year, the following colleges were visited with a view to arousing amateur seismic interest in seismology: Carleton College, St. Catherine's College, St. Thomas' College, and St. Benedict's College - all in Minnesota; Milton College in Wisconsin; and Bowdoin College in Maine. All promised active cooperation in future.

7040. Lynch, W. A. Deep-Focus Earthquakes. Trans. New York Acad. Sciences, Lancaster, Pa., ser. II, vol. 5, No. 7, 1943, pp. 159-167.

A brief introduction deals with ordinary earthquakes, the detection of earthquake waves, and reflected waves. The discussion then turns on the distinctive characteristics and distribution of deep-focus earthquakes. Seismological principles are summarized with reference to deep foci, and some problems are indicated that arise from the discovery of these foci. It is shown that studies of deep earthquakes contribute to better understanding of the interior of the earth. - V. S.

7041. Macelwane, J. B., and Sprengnether, W. F., Jr. The Sprengnether Vertical Seismograph. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 372-374.

The new apparatus aims to meet the demand for a simple, low-priced, short-period, vertical-component seismograph of fairly high sensitivity. Its construction is described with a drawing. The writers report that good records are obtained of local earthquakes and even of the shorter periods in the beginning of distant earthquakes, such as the recent Mexican earthquakes. - V. S.

7042. McComb, H. E. A Comparison of P-Phases as Registered by High- and Low-Magnification Seismographs (Abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 374.

Upon close examination of a large number of seismograms recorded with low as well as high magnification, it is found that in many cases the first impulsive phase of the P-group may be preceded, for several seconds, by a drift of the light spot away from its normal position. Under such conditions it may be difficult, it not impossible, to estimate to the desired accuracy the time of arrival of the first motion. It has been common practice to designate such a phase as "e." High- and low-magnification instruments operating on the same pier have produced records having almost identical characteristics except, of course, in amplitude. This drift seems to occur most frequently on instruments having a long natural period and for this reason may be instrumental, although it has been noticed on seismograms registered by instruments having periods as low as 1 second. If the phenomenon is real - that is, if it represents an effective tilt immediately preceding an impulsive P-phase - then it probably should appear on all records of the same earthquake. If the cause is due to some characteristic of the instrument, such as its period, travel times of several minutes duration cannot be estimated to the required accuracy.

7043. Neumann, Frank. Progress Report on Seismological Activities of the United States Coast and Geodetic Survey, April 1, 1941, to March 31, 1942. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 231-233.

Report of teleseismic and strong-motion work, dealing with the instruments used at various stations, the nature of studies, the areas covered, the collaborating institutions, improvements in apparatus, etc. A special report has been issued analyzing the accelerogram of the Imperial Valley earthquake of May 18, 1940; therein ground motion is discussed for the first time in terms of longitudinal, transverse, and rotational motion, and period data are in the form of envelopes. - V. S.

7044. Pekeris, C. L. The Propagation of an SH-Pulse in a Layered Medium (Abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 392-393.

An exact solution for the problem of the propagation of an SH-wave due to sudden application of a concentrated torsional stress at the surface of a layered medium. The solution is obtained in terms of elliptic integrals. The form of the displacement in the direct wave is like the time derivative of the applied stress. The beginning of the refracted waves is like that of the stress. At moderate distances from the source the internally reflected waves are large and increase in relative magnitude with the abruptness of the stress. The displacement at r = 4H due to the application of a stress pulse of the indicated form is shown on the drawing. It is suggested that the arrival time of a totally reflected SH-wave should be taken at the point of maximum amplitude of the phase rather than at its beginning.

7045. Potter, E. V. An Electrical Transducer Circuit for Use with Capacity Pick-Up Devices. Rev. Sci. Instruments, Lancaster, Pa., vo. 14, No. 5, 1943, pp. 130-135.

An electrical circuit suitable for converting changes in capacity into changes in a rectified electrical current has been developed by the Bureau of Mines and has been used in seismic work as well as other studies in which mechanical vibrations are involved. The circuit employs two radio-frequency oscillators and a rectifier and can be operated from batteries or 110-volt, 60-cycle alternating current. Sensitivities up to 2 ma. per micro-microfarad change in capacity and a current range of 5 to 40 ma. can be obtained with 2516 oscillator tubes. This transducer circuit has the following advantages: Its sensitivity, current range, and the shape of the current capacity curve can be readily changed. It is simple to operate. It can be used to study vibrations or capacity changes having frequencies from 0 to over 200 kc. per second. Its sensitivity depends on absolute changes in capacity rather than the relative change in total capacity. It has low background-noise level. It is free from interference by local magnetic and electrostatic fields without requiring shielding, except when such fields are close to the operating frequency of the two oscillators. - Author's abstract.

7046. Ramírez, J. Emilio. The Geophysical Institute of the Colombian Andes. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, No. 2, 1933, pp. 81-90.

The Instituto Geofísico de los Andes Colombianos was inaugurated in 1941. It consists of the Seismological Station and the Meteorological

Observatory of San Bartolomé, at the Colegio de San Bartolomé, Bogotá, Colombia. The nearest earthquake station to the northwest is in Balboa, Canal Zone; to the north, in Puerto Rico; to the west, in Honolulu; to the south, in Huancayo; and to the east, in Rio de Janeiro. - V. S.

7047. Rupnik, J. J., and Legge, J. A., Jr. The Determination of the Velocity Function ($V = V_0 + az$) for Any Given Set of Time-Depth Data by Means of the Method of Least Squares (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 328-329.

A method is described, and an example worked out, for making a best linear fit to any given set of time-depth observations such as those obtained by well shooting. Using the formula $z = (V_0/a)\ (e^{at} - 1)$, a least-squares solution is developed and then applied to a hypothetical set of vertical times and depths.

7048. Schulz, P. E. Some Characteristics of the Summit Eruption of Mauna Loa, Hawaii, in 1940. Bull. Geol. Soc. America, Washington, D. C., vol. 54, No. 6, 1943, pp. 739-746.

The 1940 eruption of Mauna Loa was confined to the summit crater, Mokuaweoweo, and the upper southwest rift. The rapid outpouring of the first day produced a lava lake, locally over 50 feet deep, over a large part of the crater. During cooling and solidifying the original surface settled from 0 feet where the flow was a foot or less deep, to 9 feet where the fill was 50 feet deep. Cooling accounts for but a small percentage of this volume decrease. The collapse of the crust that produced slump scraps along the crater walls was rapid enough to pull some of the plastic material on the under side of the crust into the form of stalactites. The intrusion of the lava under the crust of the initial flood raised pressure ridges and pressure plateaus. - Author's abstract.

7049. Seeburger, M. M. Different Types of Distubances Appearing on Iowa Seismological Records. Proc. Acad. Science for 1942, Des Moines, Iowa, vol. 49, 1942, pp. 367-373.

The Des Moines Seismological Station is compiling an atlas of typical records of earthquakes and other disturbances. The shocks listed vary in distance from 230 to 15,600 km.; they range from normal depth to 590 km. below the surface. Records date back to December 1, 1934. The author discusses disturbances affecting records - tilt, wind tremors, microseims - and examines different types of shocks; a few examples of records illustrate the text. - V. S.

7050. Stanton, A. N., and James, V. N. Square-Wave Testing of Seismograph Components (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 326-327.

In testing amplifiers and other equipment components used in geophysical research, the inherent phase characteristics as well as the amplitude characteristics may be simultaneously analyzed by means of square waves. The wave shapes resulting from the application of square waves may readily be shown to correspond to transient responses of simple R, L, and C circuits. Performance tests on seismic equipment components will be demonstrated.

7051. Walter, E. J., and Birkenhauer, H. F. Travel-Time Tables for Near Earthquakes in East-Central North America (Abs.). Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, p. 406.

These tables are based on studies by E. J. Walter of six earthquakes occurring south of St. Louis and by H. F. Birkenhauer of eight earthquakes occurring east and northeast of St. Louis. In both regions the velocity of compressional and shear waves was determined for the several layers composing the crustal structures. Times of arrival for the P-phases and the S-phases of the latter region, as well as the (S-P)-intervals, were calculated. These times have been compiled into a table that is serviceable for identifying phases in either region, with the exception of the slowest phases of earthquakes from southern azimuths. - Condensed by V. S.

7052. Widess, M. B. Multiple Branches in Seismic Reflection-Time Surfaces. Geophysics, Menasha, Wis., vol. 8, No. 2, 1943, pp. 93-104.

When for a given shot point and receptor more than one reflection is recorded from a given reflecting bed, the corresponding reflection-time surface may be said to be multiply branched. Although multiple branches are difficult to evaluate, serious errors in mapping may result when their presence is overlooked. A method is therefore proposed for the interpretation field data to account for this phenomenon. The conditions for branching and its properties are considered, showing that branches must occur in odd-numbered sets and in certain forms, which are illustrated. - Author's abstract.

7053. Wilson, J. T. A Statistical Study of the Periods and Amplitudes of Microseisms. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 228-231.

The current view is that microseisms are Rayleigh waves. The work of Ramirez, Krug, Leet, Archer, Byerly, and Wilson supports this opinion but points to waves from several directions. Similarly, the amplitude ratios of the Berkeley microseisms, as well as Uccle results, indicate that microseisms might be a mixture of Rayleigh waves and some other waves, with dominantly horizontal motion. Furthermore, the observed amplitude ratios do not agree with the theoretical ratios computed by A. W. Lee and Suzuki. Finally, the difference in period recorded on the vertical and horizontal components averages almost one-half second and is consistent throughout the year. This evidence can be explained, according to the writer, by the assumption that microseisms are a mixture of Love and Rayleigh waves and that the Love waves are of slightly longer period. - V. S.

4. ELECTRICAL METHODS

7054. Briggs, Frank. Electric Pilot Promises Better Oil Recoveries. Oil Weekly, Houston, Tex., vol. 109, No. 10, 1943, pp. 13-16.

The electric pilot is an instrument lowered into the well by means of a cable. A current will flow through the cable if the pilot is in acid or salt water and will not flow if it is in oil. Thus, at the point of fluid interface where acid ends and oil begins, the instrument will indicate a break of circuit. The construction of the pilot and the method of operation are described and illustrated by drawings. - V. S.

7055. Howell, B. F. Some Effects of Geologic Structure on Radio Reception. Geophysics, Menasha, Wis., vol. 8, No. 2, 1943, pp. 165-176.

Radio fields at standard broadcast frequencies were examined over faults to determine how the geologic conditions affected the fields. The fields in rugged and densely inhabited areas were found to be too irregular to yield understandable patterns. Very small variations in the directions of the fields were suggested but not proved over the San Jacinto fault. No variations in intensity were found over the San Andreas fault, but variations were observed at some places over the Piedmont fault in New Jersey. Such variations might be due to higher conductivity of the fault zone, or to the addition of waves reflected and refracted at the fault surface. Weak areas near San Bernardino were noted, but could not be correlated with faults. It seems improbable that surveys using standard broadcast signals will be of much value in studying radio weak spots, although other approaches may be more revealing. - Author's abstract.

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7056. Joslyn Manufacturing & Supply Co. Joslyn Direct-Reading A. C. Soil-Resistivity Meter. Chicago, January 20, 1942, Pamphlet.

Material describing the Joslyn type SR-3 soil-resistivity meter, which is direct reading and uses two metal rods joined by a lead wire for contact with the ground and a self-rectifying vibrator, driven by flashlight cells, to provide A. C. to the ground. A meter on one rod is calibrated to read resistivity of the soil from 0 to 10,000 ohm.-cm. The instrument is used in pipeline soil-resistivity surveys and is made by the Joslyn Manufacturing & Supply Co. of 3700 South Morgan St., Chicago. - D. W., Mines Mag., Denver, Colo., vol. 33, No. 3, 1943.

7057. Matubara, A. The Electrolytic Method of Prospecting. Jour. Min. Inst. Japan, Tokyo, vol. 53, 1937, pp. 515-528, 571-587.

A polarization method is described by which the counter-e.m.f. of an electrochemically active ore body can be measured in relation to a stimulating potential. - C. A. H., Annotated Bibliography of Economic Geology, vol. 14, No. 1, 1942, p. 133.

7058. Mounce, W. D., and Rust, W. M. Natural Potentials in Well Logging (Abs.). Oil Weekly, Houston, Tex., vol. 109, No. 10, 1943, pp. 56-57.

The electrical log variation is not directly related to permeability of pressure. The electrofiltration potential is actually determined by the chemical nature of the filter and the condition of its surface. If the log does show permeability, it is that of the filter cake. However, since the permeability of the filter cake is higher than the permeability of shale, the natural potential might differentiate between permeable sands and shales. Experiments have shown that less than 10 percent of the observed potential is traceable to electrofiltration potential. The remaining 90 percent cannot be ascribed to electrochemical potential, because the sum of such potentials around any point on the electrode must be zero. The authors experimented with nonpolarizing electrodes, which suggest that shale zones are the seat of the phenomena. From the results of these test, they conclude that when fresh-water drilling mud is used, the potential log may be largely a measure of the absence of argillaceous material in the formation. - Condensed by V. S.

7059. Ramachandra Rao, M. B. Spontaneous Polarization Surveys Near Guddadarangavvanahalli, Chitaldrug, Mysore State, India. Am. Inst. Min. and Met. Eng. Tech. Pub. 1613, New York, 1943, 7 pp.

Gold, copper, lead and antimony have been noticed for several years near Guddadarangavvanahalli, Chitaldrug. The Imperial Geophysical Experimental Survey cooperated in the planning of spontaneous polarization surveys. Electrical potentials were measured along a closely laid out network of stations, and equipotential lines were drawn by interpolation. The apparatus consisted of a d.c. potentiometer, and a special type of nonpolarizing electrode. It was found that one positive potential center corresponded exactly in position with a definite lode of pyritiferous graphitic schist; the apex of this lode was discovered about 100 feet below surface. The negative potential centers did not indicate the occurrence of any important ore bodies. - V. S.

5. RADIOACTIVE METHODS

7060. Goodman, Clark, and Evans, R. D. The Radioactivity of Rocks. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 544-547.

A comparison between radioactivity measurements of rocks made before 1936 and the newer experimental measurements points to the need of a downward revision of the older figures. The present estimates indicate a decrease of 40 percent in the average radium content of acidic rocks and of 60 percent for basic rocks; too few intermediate rocks have been measured to give conclusive results. The writers present evidence that the new measurements are more reliable than the old measurements. The downward revision of the average radioactive content of rocks brings about a corresponding downward revision of the rate of heat generation by radioactivity in rocks. The new values of heat generation for acidic and basic igneous rocks are somewhat less than one-third of the values of Holmes, based on the old radioactivity measurements. - V. S.

7061. Keevil, N. B. The Distribution of Helium and Radioactivity in Rocks - Rocks and Associated Minerals from Quebec, Ontario, Manitoba, New Jersey, New England, New Brunswick, Newfoundland, Tanganyika, Finland, and Russia. Am. Jour. Science, New Haven, Conn., vol. 241, No. 5, 1943, pp. 277-306.

The radioactive contents and the Helium indexes of more than 25 rocks and associated minerals have been determined. In general, low values of the helium index are attributed to escape of helium; occasionally extraneous helium is present. The mafic minerals are generally three times as active as the felsic constituents of a rock, and concentration of the radioactivity of a rock in its accessory minerals is often indicated.

Within the eastern coast belt of North America two ages are suggested for the Paleozoic granitic intrusives. In the Rouyn area, Quebec, and near Kingston, Ontario, the results with a prediabase age for acidic intrusives, but an older age for the Varsan granodiorite is suggested by helium-index data. The helium index of a granite from Petersen Lake, Manitoba, is concordant with results for other "Algoman" granites; helium indexes for two pre-Cambrian rocks from Tanganyika are of the same order of magnitude, but two indicate an abnormal loss of helium. A greater value of the helium index for the litchfieldite than for the syenodiorite at Blue Mountain, Ontario, is in accord with recent geological evidence. A diabase from Russia and a crystalloblastic pillow lava from Manitoba gave higher values for the helium index than might be expected. Closer approximations to age were obtained with iron minerals. - Author's abstract.

7062. Russell, W. L. Radioactivity of Sedimentary Rocks. Tulsa Geol. Soc. Digest, Tulsa, Okla., vol. 11, 1942-43, pp. 62-63.

Well Surveys, Inc., made 510 radioactivity determinations during 1940-43. The results showed that coal, nodular chert, limestone, dolomite, and pure sandstone are weakly radioactive; silt, shale, and volcanic ash, rather highly radioactive; and marine oil shales, very high radioactive. Radioactivity was found to increase with fineness of the grain in clastic rocks, with darkness of the shade of rocks, and with content of marine oil shale in rocks. The samples of sedimentary rocks displayed about 1.6 times more radioactivity than the average granite. - Author's abstract, condensed by V. S.

7063. Tiratsoo, E. N. Radioactivity and Petroleum. Petroleum, London, vol. 4, No. 3, 1941, pp. 58-60.

This paper offers a theory of oil formation. It reviews the general principles of radioactivity, their relations to helium, the action of α-rays on hydrocarbons, and the decomposition of nitrogenous compounds. Therein the writer explains the absence of hydrogen and the presence of nitrogen in the hydrocarbon series. He further assumes that this series has been formed from an initial pure hydrocarbon by ionization from α-radiation. M. N. Rogers suggests that the initial hydrocarbon may be methane; the experiments of Lind and Bardwell tend to support this view, but the writer finds it unnecessary to postulate methane as the original starting point. The work of Cady, McFarland, and Lind suggests that any organic substance containing the atoms C, H, N (as in all animal and vegetable matter), must break up on α-radiation into simple hydrocarbons and nitrogen. The hydrocarbons will then be converted by further -ray action into a succession of higher members with the liberation of methane and hydrogen, the latter gas going eventually to hydrogenate the oil that is formed. - V. S.

6. GEOTHERMAL METHODS

7064. Briggs, Frank. The Temperature Bomb. Oil Weekly, Houston, Tex., vol. 110, No. 4, 1943, pp. 15-17.

Well thermometers are of two types - resistance thermometers and fluid-expansion thermometers. The latter type is called a "temperature bomb." It contains a gas-filled bulb connected with a Bourdon tube to which is attached a recording pen. As the temperature of the medium around the bulb changes, the gas in the bulb and tube expands or contracts, causing the recording pen to trace a curve. The sealed bulb may contain methyl chloride, which is very responsive to temperature changes. The instrument works in pipes of conventional size. A description is given of one such thermometer in regard to structure, operation, interpretation of data and uses. - V. S.

7065. Clark, Harry. The Effects of Simple Compression and Wetting on the Thermal Conductivity of Rocks. Nat. Research Council, Am. Geophys. Union, Trans. of 1941, part II, Washington, D. C., 1941, pp. 543-544.

Known thermal gradients of the earth range from 6° per km. to 150° per km. At least part of the variation is due to a difference in the thermal conductivity of rocks through which the heat flows. The writer and Dr. Birch investigated the effects of compression and wetting on the thermal conductivity of sedimentary rocks - shales, sandstones, and limestones. The compressing apparatus is described. The results show that compression produces only small effects on the slate and the igneous rocks. For sedimentary rocks of low porosity, marble and Doubling Gap sandstone, the effect of compression alone is about the same as the combined effects of pressure and wetting. For the more porous rocks the effect of water is greater than that of compression. The effect of compressing the wet rock is small in every instance. - V. S.

7066. Kovner, S. S. Contribution to the Thermic Prospecting. Comptes rendus (Doklady) Acad. Sciences U.R.S.S., Moscow, vol. 32, No. 6, 1941, pp. 397-399.

Thermic prospecting utilizes irregularities in the earth's thermal flow produced by foreign bodies in otherwise homogeneous mediums. The author deals with such a foreign body shaped like an elliptic cylinder. He adds two further limitations: (1) Absence of other factors affectting the thermal flow; and (2) homogeneity of the various materials composing the medium. So conceived, the case still preserves prospecting significance. It is treated as a generalized Dirichlet-Neumann problem succeptible of solution by means of Fredholm integral equations. The data used are numerous typical profiles and relations of thermal conductivity calculated according to Liebmann's method of nets, simplified by the author. The results are presented in two curves. One curve shows the design of the thermal state of a salt dome; the other, the findings that should be expected from thermal prospecting at a depth of 250, 125, and 62.5 meters, respectively. It is found that the thermic profile repeats the profile of the dome. - V. S.

7067. Zies, E. G. Temperatures of Volcanoes, Fumaroles, and Hot Springs. Carnegie Inst., Washington, Geophys. Lab., Paper 1032, 1941, 19 pp.

Temperature measurements by optical pyrometer of temperatures in molten lava during an explosive eruption of the volcano of Santiaquito, in Guatemala, gave a value of about 700° C., and tests with a thermocouple inserted into a sizable fragment of ejected volcanic material gave a value of 690° C. Observations at Kilauea with a thermocouple gave a temperature of 1050° C. and by optical pyrometer a range of from 1070° to 1185° C. The article gives information of value in the interpretation of geothermal measurements. A bibliography of 24 items is included. - D. W., Annotated Bibliography of Economic Geology, vol. 14, No. 1, 1942, p. 128.

7. GEOCHEMICAL METHODS

7068. Pirson, S. J. A Two-Year Summary of Geodynamic Prospecting Results (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 327.

The paper summarizes results obtained over the past 2 years with the new technique of gas-leakage measurements. Numerous examples of results are shown in an objective manner so that those who are interested in the survival and maintenance of the oil business according to past wildcatting practices may make their own appraisal of one of the new ideas that have been submitted as holding a potential solution to the problem of dwindling oil discoveries and reserves. The examples illustrated are grouped in two classes: Predictions made on the probable outcome of drilling wells before their completion and exploratory drilling surveys.

7069. Price, R. P., and Headlee, A. J. W. Geochemistry of Natural Gas in Appalachian Province. Bull. Am. Assoc. Petrol. Geol., Tulsa, Okla., vol. 26, No. 1, 1942, pp. 19-35.

Results of further studies on the variations in composition and properties of natural gas by geologic and geographic distribution. A résumé of the geologic occurrence of methane, ethane, and higher-boiling saturated compounds, nitrogen, carbon dioxide, and hydrogen sulfide is given. It is concluded that variation in the composition of natural gas in the above-named province appears to correlate with sedimentary environment more closely than with structure of the region, as the latter is influenced by dynamic metamorphism. It was found that the different compounds in natural gas were distributed in a given reservoir, and a map of their distribution indicated the position of the gas, oil, and water with respect to each other. A definite relationship appears to exist between the composition of a natural gas and associated oil, both on an areal and a quantitative basis. The article carries much of background interest relative to soil-analysis procedures. - D. W., Mines Mag., Denver, Colo., vol. 33, No. 3, 1943.

7070. Tripp, R. M. On a Geochemical Survey of the Fort Collins Anticline (Abs.). Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, p. 326.

An objective presentation of data derived from a hydrocarbon survey of a producing Rocky Mountain structure. The influence of secondary mineralization and radioactivity on soil-wax patterns is discussed briefly.

7071. ZoBell, C. E. Bacteria as Geological Agents with Particular Reference to Petroleum. Petrol. World, Los Angeles, vol. 40, No. 6, 1943, pp. 30-43.

This article has appeared under the title "Influence of Bacterial Activity on Source Sediments," in Oil Weekly, Houston, Tex., vol. 109, No. 8, 1943, pp. 15-26. (See Abs. 113, No. 6937.)

8. UNCLASSIFIED METHODS AND TOPICS RELATED TO GEOPHYSICS

7072. Bell, H. W. Porosity Limit with Depth. Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 9, 1943, pp. 66-67.

Porosity must disappear at some depth owing to increasing pressure and heat. The fluids contained in pores will also disappear. The author calculates that the minimum depth of a collapse of porosity may be 21,000 feet, with wide variations. Some of the reservoirs may have lost their porosity at a depth of about 14,000 feet, but others may remain open with reasonable porosity at 80,000 feet. The oil in a reservoir compressed until porosity collapses must go into the gaseous phase, enter the available pores of the surrounding shales, and finally combine chemically with the formation. At the end of the paper a discussion by W. V. Howard deals with the organization of experiments. - V. S.

7073. Born, W. T. The Contribution of Geophysical Laboratories. Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 259-264.

According to information gathered in March 1943 geophysical laboratories in the United States have contributed extensively to the war. Some 40 to 50 percent of their technical staffs have been released to the armed forces or to Government laboratories. With the remaining personnel, the laboratories work mostly for the war. 80 percent of the reporting laboratories are engaged directly in war activities. They manufacture instruments of precision, such as ordnance gages for the Army and Navy, special tools and dies for the aircraft industry, Radar parts, etc. They also do research on new devices, mostly under the supervision of the National Research Defense Committee. - V. S.

7074. Bramel, H. R. Structure Chart for Solving Geological and Mining Problems. Eng. and Min. Jour., New York, vol. 144, No. 7, 1943, pp. 82-83.

A method is offered for solving in the field certain problems of structural geology involving descriptive geometry. A nail is driven perpendicularly into the flat surface of a board. To the nail is attached a string. If the free end of the string is held at various points on the board, the angle between the string and the board may be adjusted at will. For a given angle the string will touch the board on a particular circle with the nail at its center. It follows that circles representing various angles of pitch of inclination may be drawn and labeled. If radial line representing geographical bearings are now laid out on the board with the nail as the center, the string may be used to designate lines of any given pitch, of any bearing, or of both. Further, any pitching line may be represented on the diagram as a point and any dipping plane as a line. The application of this method to the following problems is described: (1) The pitch and bearing of the intersection of two planes; (2) the apparent dips of planes, cut by geological sections; (3) two components of dip defining a plane; (4) three points defining a plane; (5) line elements of planes; and (6) the true or dihedral angle between two planes. - V. S.

7075. Bridges, R. T. The Geologist: His Work in South Africa. South African Min. and Eng. Jour., Johannesburg, vol. 53, 1942, No. 2564, pp. 57-58; No. 2565, pp. 77-81.

Part 1. The Author points out that geology is a science, and science is the search for truth by experiment, observation, and logical deduction. The application of economic geology in the sensational alluvial diamond deposits of Namaqualand by geologists, where in 6 weeks 150,000 pounds sterling value were recovered, is recounted. The Lichtenburg Diggins, from which 10 million pounds sterling in diamonds was obtained in 1926 to 1929, and the part played by geologists in this area are discussed. The aid of geologists and the contribution of geophysical work in the development of the West Witts area are also described. The article shows the place and value of geological science in economic problems.

Part 2. The work of economic geologists on the staffs of active gold-mining companies and its value, are considered. The growth and importance of geophysical investigations in mining and on water location, and the work of the Union Geologic survey, are treated. Other topics under the general heading of the article are also discussed. - D. W., Mines Mag., vol. 33, No. 4, 1943.

7076. Bucher, W. H. Mechanics of Crustal Deformation (Abs.). Tulsa Geol. Soc. Digest, Tulsa, Okla., vol. 10, 1941-42, pp. 50-61.

Crustal deformations arise when the crust adjusts itself to the diminishing surface of the slowly shrinking body of the earth. The crust sags, wrinkles, and tears in the struggle for space. In the sags and primary furrows, basic and ultrabasic igneous rocks prevail almost to the exclusion of the more acid types. On swells, the same rocks predominate. The highly localized strong magnetic and gravity highs in the oil regions of the Middle West and Southwest suggest that this is a broad phenomenon. The acid series is limited to orogenic belts that have undergone strong deformation. Thus, the outer part of the crust shears off the rest in the process of orogenic deformation. In the other structural types, the magmas come into existence in the lower crust and make their way upward, largely unchanged. Superimposed on the described mechanism is the factor of great cycle, which forms new geosynclinal zones cutting across the older ones. This cycle represents a rhythmic alteration of compression and tension in the crust and seems to point to thermal changes beneath the crust as the ultimate causes. - Condensed by V. S.

7077. Campbell, R. B. Petroleum Exploration Methods. Proc. Florida Acad. Sciences for 1940, Gainesville, Fla., vol. 5, 1941, pp. 172-188.

This paper discusses the origin of petroleum, accumulation of oil, geological methods, geophysical methods, and geochemical methods; includes maps and cross sections. In the treatment of geophysical methods a distinction is made between two classes: (1) Mapping - gravitational and magnetic, and (2) sounding - seismic and electric. The four varieties are described. The approximate cost per month is: (1) Magnetometer, $1,000-1,500; (2) gravimeter, $4,000; (3) reflection seismograph, about $10,000; and (4) electrical survey, $10,000. The geochemical methods should be considered as yet comparatively uncertain but promising. - V. S.

7078. Case, L. C. Oil-Field Waters (Abs.). Tulsa Geol. Soc. Digest, Tulsa, Okla., vol. 10, 1941-42, pp. 45-48.

In prospecting for oil, generalizations concerning the effects of oil and water on one another have not proved helpful. No group of relationships appears to hold from one area to another. A summary of the evidence brought forth by Revelle, Twenhofel, Rich, Heck, and others indicate that oil may have either been formed or destroyed according to local environmental conditions. Also, water may have been entrapped in almost any conceivable concentration and composition. Concentrations range from about 1,000 p.p.m. total solids in Rocky Mountain oil-field waters to above 400,000 p.p.m. in Michigan brines. However, studies of local conditions in a given area, apparently, can be useful to prospectors. Subsurface water characteristics sometimes indicate structure that may, in turn, point to the existence of oil. Numerous instances are known of the location of delineation of faults by water analysis. The writer concludes that in prospecting it is necessary to discover in each instance the specific local relationships between oil and water for the given area, by a study of drilled wells gone to water. - Condensed by V. S.

7079. DeGolyer, E. L. War Demands More Oil - More Exploration. World Petrol., New York, vol. 14, No. 3, 1943, pp. 26-28.

War has created great difficulties in producing, refining, transporting, and exploring for oil. Exploration problems are particularly important. The United States consumes almost 1 1/2 billion barrels annually. Apparently, there is nothing to justify the belief that we can continue indefinitely to discover such a quantity of oil. It is true that during 1926-38 an average exceeding 2 billion barrels was discovered annually, owing to the advent of geophysics. But otherwise there were in the past only 2 years, 1901 and 1921, when as much as 1 billion barrels of reserves was discovered in a single year. Beginning with 1938, the situation has been discouraging. Exploration has advanced to an all-time peak, and the number of yearly discovered fields has increased, but the reserves discovered annually have dropped sharply, and the average reserves discovered per field have declined. Yet the war is continuously increasing the consumption of oil. Accordingly, the author concludes that we shall need more oil then we are able to produce; certain areas will experience shortages in productive capacity within the very near future. - V. S.

7080. Howard, W. V. The Derivation of Reservoir Rocks, Part I. Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 7, 1943, pp. 158-160, 183-187.

The materials that form reservoir rocks are derived from the disintegration and decomposition of older rocks. Each rock exposed to erosion provides material that is transported seaward and may form new sediments or may alter the composition, porosity, and permeability of those already deposited. The leached material remaining may also form reservoirs. In this installment, reservoirs derived from sandstones of the quartzitic type are discussed. The relationships of other rock classes will be taken up in subsequent articles in the series. - Author's abstract.

7081. Howard, W. V. Exploration Methods Combine Old and New Practices. Oil and Gas Jour., Tulsa, Okla., vol. 39, No. 47, 1941, pp. 40-41.

The article evaluates petroleum-exploration procedures. Methods are listed in order of generally increasing accuracy and increasing cost as follows: (1) Geological interpretations of logs of wells drilled by others; (2) surface geology (where possible); (3) magnetic surveys and/or electrical surveys (in limited areas where they work); (4) gravity surveys and/or soil analyses; (5) regional core drilling; (6) seismic surveys; (7) intensive core drilling with electrical and geochemical logs; (8) drilling for production development. This listing, supplied by J. L. Adler, is discussed from various angles, and it is brought out that surface structures are not all found and that there is a trend back to the older methods (surface geology) and a realization that newer methods should supplement rather than crown out older ones. xxx - D. W., Annotated Bibliography of Economic Geology, vol. 14, No. 1, 1942, p. 122.

7082. Kelly, M. E. Well Logging. Fuel, London, vol. 22, No. 3, 1943, pp. 55-56.

Briefly outlines existing methods of well logging: (1) Electrical and permeability logging; (2) radioactivity or ray logging; (3) neutron or hydrogen logging; and (4) geochemical logging. - V. S.

7083. Levorsen, A. I. Role of Stratigraphy in Oil Geology. Pan-Am. Geol., Des Moines, Iowa, vol. 77, No. 5, 1942, pp. 323-326.

The author discusses a working definition of a stratigraphic field. W. B. Wilson divides the closed reservoirs into four groups: (1) Reservoirs closed by local deformation of strata; (2) reservoirs closed because of varying porosity of rock (contours may not close if drawn on upper surface of reservoir only - no deformation of strata is necessary other than regional tilting); (3) reservoirs closed by combination of folding and varying porosity; and (4) reservoirs closed by combination of faulting and varying porosity. The author adopts this classification. He defines stratigraphic fields as those producing chiefly from reservoirs of class (2), together with those of classes (3) and (4) when the porosity factor is dominant. - V. S.

7084. Maximovich, G. A. Porosity of Geospheres. Comptes rendus (Doklady) Acad. Sciences U.R.S.S., Moscow, vol. 37, Nos. 7-8, 1942, pp. 215-217.

The data of hydrogeological, mining, and oil-prospecting expeditions, running into tens of thousands of estimates, have been used for a calculation of the minimal, maximal, and average porosity of different rocks and geospheres. The results are contained in a table, "Porosity of Rocks in Different Geospheres," covering hydrophilic and hydrophobic geospheres, various rocks and muds, porosity (in percentages), approximate number of estimates, and average porosity for geospheres. It is found that the porosity of geospheres ranges from 0.5 in the pelo- and pedo-sphere down to 0.01 and less in the granito- and basalto-sphere. The porosity of surface geospheres is determined by their position in the earth crust, and it depends on thermodynamic conditions. This dependence accounts for the decrease of the average porosity in the direction from the pedosphere to the core. - V. S.

7085. The Oil Weekly. Results of Intensive Wildcatting Not Enough to Meet Needs. Houston, Tex., vol. 110, No. 8, 1943, pp. 21-30.

The United States Petroleum Administration for War considered that 4,500 wildcat wells should be drilled in 1943, as compared with 3,166 drilled in 1942 and 3,264 in 1941. Actually, in the first half of 1943. 1,602 exploratory tests were completed in the United States, indicating an annual rate of 3,204 wildcats or only 71 percent of the 4,500 regarded essential. Even less satisfactory is the rate of actual discoveries. The number of successful wildcats was 20 percent lower this year than last year, having totaled only 224 against 281. Only 14.9 percent of the total wildcats of the first half of 1943 discovered new sources of oil, distillate, or gas, in comparison with 18.4 percent that were productive in the first half of 1942. The gas discoveries showed no decline, but oil discoveries declined. New oil fields found in the first half of 1943 totaled 133 against 161 last year, a decrease of 17 percent; discoveries of new oil horizons dropped from 86 to 51, a decline of 41 percent. The paper describes the success of drilling in the different States. A comprehensive table is included, "Wildcats Completed in the United States in First Half of Year". - V. S.

7086. The Oil Weekly. Scientists Seriously Consider Improving Oil Finding. Houston, Tex., vol. 109, No. 6, 1943, pp. 36-40.

At the annual meetings of the American Association of Petroleum Geologists, the Society of Exploration Geophysicists, and the Society of Economic Paleontologists and Mineralogists in Fort Worth, the papers presented stressed the need for finding more oil fields. The situation was regarded as critical by most speakers. The remedies suggested included "discovery thinking," cooperation in prospecting, broadening of geophysical exploration, use of new methods and instruments, wildcatting, utilization of stripper wells, price increases, and adequate supply of manpower. - V. S.

7087. Parsons, C. P. Caliper Logging. Trans. Am. Inst. Min. and Met. Eng., Petrol. Devel. and Technol., Petrol. Div., New York, vol. 151, 1943, pp. 35-47.

Caliper logging is a practice of measuring the variations in the diameter of the open hole in a well. This information is useful for many purposes, among which are: Determining the volumetric capacity of the portion of open hole to be cemented; the amount of gravel to be used for gravel-packing a well; the size and location of seat for a packer to be placed in a well; studying the effects of nitroglycerin shots; studying the effects of acidizing; studying the cause of drill-pipe failures; studying drilling technique; geological correlations. This is a new practice in oil fields and is eliminating considerable guesswork. - Author's abstract.

7088. Patrick, H. G. Transportation. Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 256-259.

This paper is one of a series presented at a conference on maintaining geophysical operations during the war in Fort Worth, Tex., April 7, 1943. The author discusses the transportation difficulties experienced by geophysical operators and shot-hole drillers in the Southwest and Midwest in regard to tires, new automotive equipment, and spare parts. He finds that so far oil finding has been carried on with little new equipment. If, however, diligent exploration is to be continued, the geophysics industry will need new trucks and an adequate supply of replacement parts. - V. S.

7089. Petroleum World. Geology of Sedimentary Rocks. Los Angeles, Calif., vol. 40, No. 6, 1943, p. 26.

P. D. Krynine lectured before the Pacific Section of the American Association of Petroleum Geologists on sedimentary rocks. He believes that the nature of the sedimentary deposits in oil regions furnishes information on reservoir characteristics and discovery problems. The individual grains forming the oil-field rocks are crystal fragments of the solid rocks from which the sediments were eroded. Under certain conditions, these crystal fragments continue to grow slightly after being carried away by erosion. Such renewed crystal growth is an index of the original conditions of deposition and can serve as a guide to oil. - V. S.

7090. Roberts, John. The Search for Oil. Petrol. Times, London, vol. 47, No. 1,196, 1943, pp. 255-256, 264.

Oil fields occur in zones of great rock disturbances. This relationship is well-illustrated by the Parma-Bologna region, Italy, where oil fields follow the contour of the Apennines, at a distance of about 30 miles from the ridge. The same relationships are found in the Caucasus, the Carpathians, the Andes, North American coastal ranges, and the Persian, Burmese and East Indian mountains. It is further known that oil forms at high temperatures. Accordingly, the presence of marble and anthracite in a region is likewise an indication of oil deposits, because these rocks form at about 800° C. In the Allegheny region are found antracite, graphite, marble, and oil. The author draws conclusions as to the mechanism of oil formation and infers that there can be oil in the British Isles. - V. S.

7091. Thom, W. T., Jr. The Major Deformational Patterns Characteristic of the Earth's Crust and Their Mechanics-of-Origin. Nat. Research Council, Am. Geophys. Union, Trans. of 1942, part II, Washington, D. C., 1942, pp. 708-710.

Available evidence shows that the earth's crust can move laterally with respect to the centrosphere, that surpluses of crustal area are recurrently eliminated by crumpling and overthrusting, and that the deformational patterns are primarily due to compression. The writer discusses the main deformational patterns: (1) Seismic-and-volcanic, (2) topographic-and-tectonic, and (3) geodetic-and-gravitational. The forces of compression operate in a relatively strong, brittle upper crust underlain by a zone of isostatic adjustment possessing much greater mobility. - V. S.

7092. Tiratsoo, E. A. Geology and the Search for Oil. Petroleum, London, vol. 2, 1940, No. 6, pp. 194-196, 201-204; No. 7, pp. 237-242; No. 8, 267-276. Vol. 3, 1941, No. 1, pp. 14-16; No. 2, pp. 58-60.

Discusses the following general subjects: (1) Formation of oil deposits and the exploration thereof; (2) problems of exploitation; (3) commercial production; (4) varieties of petroleum reservoirs; and (5) estimation of reserves. - V. S.

7093. Weatherby, B. B. Report of the War Efforts Advisory Committee. Geophysics, Menasha, Wis., vol. 8, No. 3, 1943, pp. 244-252.

The War Efforts Advisory Committee of the Society of Exploration Geologists consists of B. B. Weatherby, chairman, and H. C. Cortez, R. D. Wyckoff, Herbert Hoover, Jr., W. G. Green, and F. Goldstone. The committee submitted a report of activities to the conference on maintaining geophysical operations during the war in Fort Worth, Tex., April 7, 1943. The report states that activities consisted in circulating questionnaires among geophysical organizations in regard to facilities for war work; maintaining contact with defense agencies, such as the Physicists Committee of the War Manpower Commission, Petroleum Administration for War, Petroleum Industry War Council, and this council's Manpower Committee; collecting information on the manpower situation in geophysical exploration and communicating findings to the said Manpower Committee; taking steps toward the creation of an Exploration Committee with the War Manpower Commission; and, finally, submitting to the Petroleum Administration for War a program of action for improving the manpower crisis in geophysical exploration. - V. S.

7094. World Petroleum. Scientific Systems of Survey Main Reliance for Discovery. New York, vol. 14, No. 3, 1943, pp. 29, 66.

Before the start of the present war the annual estimates of United States oil reserves reached 19 billion barrels and increased steadily from year to year. However, while discoveries continued the annual additions to the reserves grew smaller. Then came the war, with its tremendous demand for oil. Since the drain on the reserves increases while their growth decreases, the available balance is falling rapidly. There is no reason for alarm, because the country's potentialities of oil have not been exhausted, but a greater amount of exploration will be needed. Not only must more fields be discovered, but drilling must be carried to greater depths and extended to marginal or doubtful areas. Competent exploration may also discover stratigraphic traps, which are particularly profitable. The fundamental requisites for a successful campaign are a broader and more intensified employment of geological and geophysical surveys, improvement of methods and instruments, and skillful combination of all available devices and information. - V. S.

9. NEW PUBLICATIONS

7095. Bernewitz, M. W. von. Handbook for Prospectors and Operators of Small Mines, 4th ed. revised by H. C. Chellson. McGraw-Hill Book Co., New York, 547 pp., 161 figs., 1943. Price, $4.00.

In this volume H. C. Chellson, editor of Mining Congress Journal, has edited the material prepared by the last M. W. von Bernewitz for the 4th edition of his handbook. The edition contains five parts; a 40-page glossary of geologic and mining terms is appended. One of the previous editions was reviewed in Abs. 25, No. 197. - V. S.

7096. Billings, M. P. Structural Geology, 473 pp., 336 figs., 19 pls., New York, Prentice-Hall, Inc., 1942. Price, $4.50.

This book contains a chapter on geophysical methods. - V. S.

7097. Coast and Geodetic Survey, U. S. Department of Commerce. Progress Report on Strong-Motion Earthquake Work, April, May, June, 1943. MSP-45, Washington, D. C., 1943, 3 pp.

The following work is described: (1) San Francisco Office, questionnaire program; (2) strong-motion work; (3) vibration work; (4) principal earthquakes; and (5) Washington office. - V. S.

7098. Earthquake Notes, A. K. Ludy, Editor, vol. 14, No. 3/4, 10 pp.: Seismol. Soc. America, Eastern Section, Washington, D. C., 1943.

This issue contains the following notes: (1) Uses of seismology in geological studies; (2) Cuscatlan bridge in El Salvador; (3) the Turkish earthquakes; (4) New Zealand earthquakes; (5) photo-developing problems; (6) new volcano in Mexico; (7) seismograph for Mexico; (8) local earthquakes recorded in Missouri; (9) the Fordham records of the Ecuador earthquakes, May 14 to July 12, 1942; and (10) notes of interest. - V. S.

7099. Roberts, J. K. Annotated Geological Bibliography of Virginia, 726 pp., Charlottesville, Va., Alderman Library, 1942. Price, $4.00.

This bibliography lists all publications that had appeared before the end of 1940 on the geology in one of the older States. More than 2,500 entries are abstracted, most of them in comprehensive fashion and with author's comment. A statistical summary of the mineral resources of Virginia is included. A full index facilitates reference to subjects and authors. - C. R. Longwell, Mines Mag., vol. 33, No. 6, 1943, p. 329; - Condensed by V. S.

10. PATENTS

7100. Automatic Amplitude Control System; Herbert Hoover, Jr., Sierra Madre, Calif., assignor to Consolidated Engineering Corporation, Pasadena, Calif., a corporation of California. U. S. Patent 2,307,790, issued January 12, 1943.

In an amplifier having an input and an output, band pass filtering means connected intermediate said input and said output designed to pass waves lying within an extended frequency range, an automatic amplitude-control circuit responsive to output signals and adapted to produce gain-control voltages having an alternating-current component superimposed on a direct-current component, said component having a frequency lying in said range, and a circuit connected to apply said gain-control voltages to a gain-control element in said amplifier preceding said filtering means to vary the gain of said amplifier as an inverse function of the output-signal strength, said circuit including means providing a negative feedback connection for waves of a frequency lying in a portion of said extended range at the low-frequency and thereof while simultaneously acting as a filter which attenuates any component of a frequency in the remaining portion of said range regardless of phase shift in said remaining portion to such a degree that the all-around gain through the amplifier and automatic volume-control circuit lies below the point of regenerative instability in said remaining portion. - Claims allowed, 6.

7101. Rotating Contact Device; Cecil J. Haynes, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,307,887, issued January 12, 1943.

A borehole electrode adapted to be attached to the end of an electrical cable for longitudinal movement along a borehole comprising telescoping members, a pair of leaf springs having each end attached to a separate unit of said telescoping members and their central portion spaced away from said telescoping members, a toothed disk mounted on the central portion of each spring for rotation along the lognitudinal axis of the borehole in which said electrode is placed. - Claims allowed, 2.

7102. Operations in Boreholes; Lynn G. Howell, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,308,176, issued January 12, 1943.

In an operation conducted in a borehole in which at least two extraneous materials are placed in the borehole and it is desired to determine the position which such materials assume in the borehole, the steps of adding to each such material before introducing it into the borehole a radioactive material of relatively short life, the life of said radioactive material being different for each such extraneous material, placing said materials in the borehole, producing a radioactive well log of said borehole during the life of the shortest lived radioactive material, and producing a second radioactive log of said borehole after the termination of the life of the shortest lived radfoactive material whereby the location of the extraneous material containing the shortest lived radioactive material can be determined by comparison of said logs. - Claims allowed, 2.

7103. Method and Apparatus for Measuring and Recording Vibrational Effects; William Robertson Welty, San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex. U. S. Patent 2,309,560, issued January 26, 1943.

In apparatus for integrating and recording pulsating current, the combination with a transformer to which the current is fed, thermionic valves in push-pull relation, means delivering the output energy of said transformer to the control grids of said valves in opposed phase, a galvanometer having the winding terminals thereof connected to the respective anodes of said valves, and a condenser and resistor arranged to shunt across said terminals, the value of the condenser impedance being sufficiently low as compared with the value of the resistor, the impedance of the values, and the galvanometer winding to effect approximate integration of the initial pulsating current. - Claims allowed, 3.

7104. Transducer; Josephus O. Parr, Jr., San Antonio, Tex., assignor to Olive S. Petty, San Antonio, Tex. U. S. Patent 2,311,079, issued February 16, 1943.

A magnetic seismometer including, in combination, a cylindrical, tubular casing of magnetic material, a pole piece at and magnetically associated with each end of the casing, a steady mass of magnetic material spring-supported from and in said casing for relative axial movement in respect to said pole pieces, a permanent magnet intermediate the ends of the casing and extending from the same toward the steady mass to provide and energize two parallel magnetic circuits the reluctances of which are inversely varied by said relative movement, a pair of similar coils fixed in said casing and each adapted to generate a voltage when linked by changing magnetic flux in one of said circuits resulting from such relative movement, said coils being so wound and connected together as to add the generated signal voltages, said connection being such as to cause voltage generated in the coils by stray fields to oppose and cancel each other. - Claims allowed, 12.

7105. Apparatus for Measuring Gravity; Gunnar Nørgaard, Copenhagen-Kastrup, Denmark, assignor to Aktiebolaget Elektrisk Malmletning, Stockholm, Sweden, a company of Sweden. U. S. Patent 2,311,771, issued February 23, 1943.

In an apparatus for measuring gravity, the combination of a base, two pairs of substantially vertical filaments of resilient material connected at their lower ends to said base, the filaments of each pair converging towards their upper ends and being connected to one another at said ends, the distance between said two pairs of filaments at their upper ends being different from the distance between said pairs of filaments at their lower ends, a vessel surrounding said base and said filaments, a liquid in said vessel in which said base and said filaments are immersed, and means for observing the relative position of the upper ends of said filaments. - Claims allowed, 7.

7106. Resistance Thermometer; Whitman D. Mounce, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,315,127, issued March 30, 1943.

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An electrical circuit adapted to be lowered into a borehole filled with a drilling fluid at the end of a conductor cable and including a conductive element exposed to the fluid in the borehole and adapted to respond to temperature changes in said fluid, means for supplying alternating current to said conductive element and means for converting the changes in said alternating current due to changes in the temperature of said exposed conductive element into direct current voltages whereby the latter may be transmitted to the surface by the same means which carries the alternating current from the surface. - Claims allowed, 6.

7107. Well-Surveying Method and Apparatus; S. A. Scherbatskoy, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,315,355, issued March 30, 1943.

A method of geophysical prospecting that comprises lowering a detector of radioactivity into a drill hole through the stem of the drill being used to drill the hole, and simultaneously continously recording the radioactivity of formations surrounding the drill stem as an indication of their nature. - Claims allowed, 4.

7108. Borehole Thermometer; W. J. Crites, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Delaware. U. S. Patent 2,315,840, issued April 6, 1943.

A temperature gage to record the variation in temperature in a well bore comprising a housing, thermally responsive means comprising an expansion fluid container responsive to temperature conditions in the well bore, said container assuming the shape of a collapsed sphere with the collapsed surfaces coming in close proximity with each other, the collapsed surfaces being responsive to the expansion and contraction of the fluid medium due to temperature change, coupling means mounted on the container for transmitting movement, a clock mechanism mounted in the housing having a shaft rotated by said mechanism, a record cylinder attached to the shaft, and a stylus carried by the coupling means on the container and movable therewith bearing against the recording cylinder. - Claims allowed, 1.

7109. Addition Agent for Enhancement of the Properties of Drilling Muds; Milton Williams, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,315,995, issued April 6, 1943.

A water-soluble glass which is a shock-chilled anhydrous glassy melt of an alkali metal phosphate homogeneously associated with an oxygen-containing compound, of a normally solid element other than phosphorus, of groups 2-8 of the periodic system having a normally solid oxide, the content of said element, in terms of its oxide, in said glass being at least 1 percent by weight, said glass having a more permanent deflocculating and viscosity-reducing effect upon a solid aqueous suspension than an equal quantity of sodium hexametaphosphate. - Claims allowed, 7.

7110. Method and Means for Taking Cores; Benjamin W. Sewell, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,316,024, issued April 6, 1943.

A device for obtaining cores comprising, in combination, a body adapted for longitudinal movement in a drill stem provided with a passage arranged for containing the solid mineral portion of said core open at the bottom for receiving said core, means in the lower end of said body, for retaining a core in said passage without closing the entrance to the passage, and a transparent cylinder arranged in said body having its lower end in fluid communication with said passage, and its upper end provided with a closure. - Claims allowed, 6.

7111. Apparatus for Taking Samples of Fluid from Wells; Alvin M. Bandy, Ganado, Tex. U. S. Patent 2,316,216, issued April 13, 1943.

In a sample taking device having a sample chamber and provided with a channel entering said chamber; a tubular probe through which said channel extends and having a tapered lower end adapted to penetrate into the earth stratum to be tested and to form a seal therewith, an annular downwardly directed edge around the probe above the tapered lower end thereof and a tubular screen in the probe across said channel. - Claims allowed, 2.

7112. Subsurface Prospecting; D. G. C. Hare, Houston, Tex., assignor to Texaco Development Corporation, New York, N. Y., a corporation of Delaware. U. S. Patent 2,316,329, issued April 13, 1943.

In the process of investigating the formations surrounding a borehole in which a source of neutrons is passed through the hole, the neutrons penetrating the formations and certain of these neutrons being scattered in the formations, slowed down and returned to a detector disposed near the source, the method of increasing the number, energy, and speed of the neutrons entering the formations which comprises mixing with the material comprising the source of neutrons a substance in which nuclear fission can be produced with attendant liberation of neutrons so that, due to the bombardment of said substance by the neutrons from said source, nuclear fissions will take place whereby the neutrons leaving the mixture will be greater in number and will have a higher energy and speed than would be the case if the neutron source alone were used. - Claims allowed, 4.

7113. Method and Apparatus for Surveying Wells; R. G. Piety, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Delaware. U. S. Patent 2,316,361, issued April 13, 1943.

The method of determining the distribution of radioactive materials in the earth surrounding a borehole comprising placing in the borehole a directional detector responsive to radioactive radiations, and observing the direction and response of said detector with respect to a reference point on a magnetic compass. - Claims allowed, 16.

7114. Well-Surveying Method and Apparatus; R. E. Fearon, Tulsa, Okla., assignor to Well Surveys, Inc., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,316,576, issued April 13, 1943.

In a geophysical prospecting device, the improvements including an electrical circuit that comprises an electrical bridge, an ionization chamber included in one leg of said bridge, a condenser included in an adjacent leg of said bridge, resistances included in each of the other legs of said bridge, a source of electrical potential connected diagonally across said bridge in one direction, a fixed impedance connected diagonally across said bridge in the other direction, and a measuring instrument connected across said fixed impedance. - Claims allowed, 6.

7115. Gun Perforator; R. R. Thompson and W. D. Mounce, Houston, Tex., assignors to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,316,728, issued April 13, 1943.

A well-borehole gun barrel comprising a metal body having an elongated recess therein having a sealed inner end, a projectile fitted into the open end of said recess, a powder charge compressed in situ in the inner end of said recess by said projectile, said projectile being of a size to make a snug fit with said barrel, and the compression pressure being of the order of that required to compress the powder in finely divided form to half its original volume, and a firing element in said power charge. - Claims allowed, 5.

7116. Apparatus for Measuring Temperatures in Boreholes; H. G. Doll, Houston, Tex., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,316,942, issued April 20, 1943.

Apparatus for obtaining indications of temperatures in a borehole, comprising a temperature-responsive resistance element lowered into the borehole, an electrical network connected to said resistance element and forming a Wheatstone bridge having at least four apices, at least one of which is disposed in the borehole with said resistance element and is connected to ground therein, a source of electrical energy at the surface of the earth, an electrical circuit connecting said source to the apex of the bridge opposite said ground point at the surface of the earth, electrical indicating means at the surface of the earth, and a second electrical circuit connecting said indicating means to the other two opposite apices of the bridge. - Claims allowed, 8.

7117. Device for Determining the Strata Traversed by Drill Holes; H. G. Doll, Paris, France, assignor, by mesne assignments, to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,317,259, issued April 20, 1943.

A device for the determination of the strata traversed by a drill hole, comprising an electrode placed inside the drill hole, means for sending an electric current between this electrode and a reference point, a second electrode placed at a slight distance from the first electrode and connected by an insulated conductor to an apparatus for measuring potential differences placed at the surface of the ground and whose other terminal is earthed, and a third electrode placed at a distance from the first electrode greater than the distance separating the first two electrodes and also connected by an insulated conductor to another apparatus for measuring the potential differences and whose other terminal is earthed. - Claims allowed, 8.

7118. Apparatus for the Electrical Surveying of Boreholes; Conrad Schlumberger, Paris, France; Anne M. L. Doll, Administratrix of said Conrad Schlumberger, Deceased, assignor, by mesne assignments, to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,317,304, issued April 20, 1943.

A device for measuring in a borehole filled with liquid the electrical resistivity of the formations traversed by said borehole, said device comprising a source of current adapted to be lowered into said borehole in the neighborhood of the formation to be surveyed, two electrodes adapted to be submerged in said liquid and connected to the terminals of the source of current, and means for measuring the differences of potential created in the formations by said source of current. - Claims allowed, 29.

7119. Master Control for Electric Seismographs; E. J. Shimek, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York. U. S. Patent 2,317,334, issued April 20, 1943.

An apparatus for recording seismic waves comrpising in combination, means forming a conventional spread for detecting said waves by generating electrical signals corresponding to them, means for amplifying and recording said signals in coordination with time, an additional detecting means adapted to be positioned adjacent the shot point for detecting waves that have traveled vertically upward from their point of creation, means for connecting said additional detecting means to amplifying means common to one of the first mentioned detecting means, a gain control for controlling the gain in amplification imparted to the signals by said amplifier, common means for rendering the additional detecting means inoperative and for initiating the operation of the gain control a predetermined time after the creation of the seismic waves, said gain control comprising for reducing the gain in amplification after signals corresponding to detected direct traveling waves have been amplified and recorded, means for thereafter increasing the gain in amplification at a predetermined rate through a predetermined period of time, and means for accelerating the rate of increase of the gain in amplification throughout the period of time while the remainder of the record is being recorded, whereby signals corresponding to direct traveling waves are recorded with maximum gain in amplification and signals corresponding to detected reflected waves are recorded with substantially equal amplitude. - Claims allowed, 4.

7120. Well Surveying Instrument; G. L. Kothny, Strafford, Pa., assignor to Sperry-Sun Well Surveying Co., Philadelphia, Pa., a corporation of Delaware. U. S. Patent 2,317,386, issued April 27, 1943.

A well-surveying instrument comprising a casing adapted to enter a borehole, means for supporting a record member within said casing, means, comprising an electrical circuit, for effecting marking of said record member in accordance with the position of said casing, and means for controlling flow of current in said circuit, said means comprising a battery, and a circuit for drawing heavy currents from said battery so that the current falls off rapidly thereby to effect a controlling action. - Claims allowed, 6.

7121. Means for Surveying Well Bores; L. C. Miller, Dallas, Tex., assignor, by direct and mesne assignments, of One-Half to Eastman Oil Well Survey Co., Dallas, Tex., a corporation of Delaware, and One-Half to Eastman Oil Well Survey Corporation, Long Beach, Calif., a corporation of California. U. S. Patent 2,317,632, issued April 27, 1943.

An apparatus for surveying a borehole including, an instrument adapted to be lowered into the borehole, said instrument including a casing, rotatable contact arms mounted within the casing and movable to various circumferential positions therein, a compass unit associated with one of the contact arms for maintaining said arm in a predetermined azimuthal position, means responsive to inclination from the vertical associated with the other contact arms to move said arms into positions in accordance with the direction and degree of inclination of the casing, a single rotatable circuit closing element adapted to engage the various contact arms, each such engagement closing an electrical circuit, and means within the casing actuated by the engagement of the element with the contact arms for transmitting electrical impulses to the surface, said impulses being indicative of the circumferential positions of the contact arms and representative of the direction and degree of inclination of the borehole. - Claims allowed, 22.

7122. Well Surveying Device; G. L. Kothny, Strafford, Pa., assignor to Sperry-Sun Well Surveying Company, Philadelphia, Pa., a corporation of Delaware. U. S. Patent 2,318,612, issued May 11, 1943.

An electrical timing means comprising a plurality of chambers, means for controlling flow of electrically conductive liquid from one chamber to another, the latter chamber having internal conductive walls adapted to make electrical contact with said liquid, and electrode means arranged in the latter chamber to be electrically connected by said liquid after occurrence of a predetermined flow, and to be disconnected electrically after occurrence of a further predetermined flow. - Claims allowed, 2.

7123. Magnetic Permeability Indicator; W. A. Bruce, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,318,666, issued May 11, 1943.

A hand device for testing welds, comprising a pair of concentric tubular members, a head on said members having a metal surface adapted to be placed against the weld to be tested, a well in said head member in alinement with said inner tubular member, a soft iron core slidably mounted in said inner tubular member and extending into said well, a spring normally holding the end of said core spaced from the end of said well, a coil for magnetizing said core arranged around said inner tubular member, a signaling means arranged in said casing, an electrical circuit for operating said means, and a switch in said circuit adapted to be operated by movement of said magnetic element into said well. - Claims allowed, 1.

7124. Tracing Gas through Underground Formations; L. R. Hodell and J. J. Heigl, Tulsa, Okla., assignors to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,318,689, issued May 11, 1943.

In the process of producing fluids from an underground reservoir, the steps of injecting a gas into the reservoir at a plurality of points, adding a different gaseous tracing agent to the gas injected at each separate point, producing the reservoir from a plurality of points substantial distances from the points of injecting gas in said reservoir, and analyzing the production for the presence of each of said tracing agents. - Claims allowed, 1.

7125. Magnetic Permeability Indicator; B. W. Sewell, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,318,720, issued May 11, 1943.

A hand device for testing welds comprising a tubular casing, a permanent magnet mounted in said casing, an outlet for the flux of said magnet extending from one end of said casing to one pole of said magnet and adapted to be placed against the weld to be tested, a signaling device mounted within said casing, an electrical circuit for operating and signaling device, and a switch in said circuit including a spring arm adapted to be held in closed position by said magnet and to open upon the leakage of magnetic flux from said magnet. - Claims allowed, 4.

7126. Seismograph Amplifier System; L. J. Peters, Tulsa, Okla., assignor to Gulf Research & Development Company, Pittsburgh, Pa., a corporation of Delaware. U. S. Patent 2,318,795, issued May 11, 1943.

In combination, means for detecting a vibratory disturbance, means for amplifying the impulses from said detecting means for recording the amplified impulses, and means actuated by said first mentioned means for controlling the amplification ratio of said amplifier means at such a rate that all phases of the record are of usable amplitude. - Claims allowed, 12.

7127. Geochemical Prospecting; Leo Horvitz, Houston, Tex., assignor to Esme E. Rosaire, Houston, Tex. U. S. Patent 2,319,734, issued May 18, 1943.

In a method of prospecting for petroliferous deposits in which samples of soil are collected in the area to be investigated and are analyzed for a constituent indicative of the presence of oil in a subterranean formation in said area, the step of determining the relative amounts of fine and coarse material in the soil samples, whereby the ratio of these materials may be utilized in the interpretation of the results. - Claims allowed, 3.

7128. Method and Apparatus for Geoelectrical Exploration; S. J. G. Pirson, State College, Pa., assignor of One-Half to Shelley Krasnow, County of New York, N Y. U. S. Patent 2,319,764, issued May 18, 1943.

In a method of determining underground structure the improvement which comprises causing an electric surge to travel through the earth between spaced electrodes embedded in the surface of the earth and receiving the electric impulses reflected by the geologic strata upon an electric circuit in which there is a suitable indicating instrument, the duration being such that said electric surge terminates before said reflected electric impulses are received. - Claims allowed, 31.

7129. Method for Seismic Surveying; E. J. Shimek, Dallas, Tex., assignor to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York. U. S. Patent 2,320,248, issued May 25, 1943.

In a method of seismic prospecting that comprises creating seismic waves in the earth's surface, detecting the waves after reflection from the interfaces of the substrata by generating corresponding electrical signals and recording the electrical signals in coordination with time that comprises creating seismic waves in the earth's surface by delivering mechanical impulses to the earth's surface at a rate that will produce signals having frequencies falling within predetermined narrow wave bands, selectively detecting said signals, electrically integrating the detected signals, and recording the resultant signal in coordination with time. - Claims allowed, 2.

7130. Geochemical Prospecting; T. H. Dunn, Tulsa, Okla., assignor to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,320,577, issued June 1, 1943.

In the art of exploration for underground hydrocarbon deposits, the steps which comprise systematically collecting a series of samples of surface soil at spaced locations, extracting said samples separately with an organic solvent for solid, petroleum-derived constituents present initially in said samples in soluble form, evaporating said organic solvent from each of said extracts, and weighing the residual solid, petroleum-derived constituents, whereby valuable information is obtained concerning the location of said underground hydrocarbon deposits. - Claims allowed, 8.

7131. Improvements in Geophysical Instruments; Bolidens Gruvaktiebolag, of Stockholm, Sweden, a Swedish company. British Patent 550,470, issued January 8, 1943.

Gravimeters, seismographs, geophones, magnetometers and other instruments for geophysical researches comprising a body movable in a predetermined direction or about a predetermined axis the said body being subjected to the influence of gravity or another field of force and wherein the effect of the weight of the body or that force on the body has been counterbalanced by forces such as spring devices or in any other manner, characterized by the movable body being subjected to the action of one force or two oppositely directed compression forces of the same size acting substantially perpendicularly to the direction in which the body is free to move. - Claims allowed, 7.

7132. Improved Gravimeter; Bolidens Gruvaktiebolag, of Stockholm, Sweden, a Swedish company. British Patent 551,917, issued March 16, 1943.

Apparatus for measuring the force of gravity or variations in the same, with the aid of a movable body, the weight of which has been counterbalanced or biased for instance by means of a spring device, the said movable body having plates or surfaces which are separated from stationary surfaces by small gaps the variations in the width of one of which influence an electric or magnetic field, the strength of which is measured by suitable means and serves as a measure of the magnitude of the force of gravity, characterized by the feature that the movable body is provided with two or more surfaces or plates which are positioned at the same (or nearly the same) small distance from two or more stationary surfaces or plates, whereby two or more narrow gaps are formed between the said plates or surfaces of the movable body and the said stationary surfaces or plates, one of the said gaps controlling (or forming part of) the electric or magnetic field the strength of which serves as a measure of the magnitude of the force of gravity, while the other gap or gaps serve exclusively in combination with the first gap to control symmetrical damping of the movable body. - Claims allowed, 3.

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